Depression Detection using Facial Recognition and Sentimental Analysis

ABSTRACT

Depression is a mental health disorder that affects millions of people worldwide.It could be identified by analyzing certain symptoms like fatigue, trouble sleeping, changes in appetite, and difficulty concentrating or making decisions.

Our model leverages weighted voting of PHQ9 and face recognition techniques to analyse the textual responses and facial features along with response time to detect signs of depression in a person, as early detection and treatment of depression are crucial for improving outcomes and preventing complications such as suicidal thoughts or substance abuse.

Existing depression analysis system is based on conventional query based systems.

Most commonly employed methodology is MHQ(Mental Health Quotient) designed by sapiens lab and a depression domain specific as well as most commonly employed PHQ9 (Patient Health Questionnaire). **Some of the disadvantages of the existing system includes:**

- All of the existing systems are based on sentiment analysis,i.e. just by analyzing plain text.
- For example; "Fine" - Depending on the tone used, it can indicate acceptance or agreement, or it can imply dissatisfaction or annoyance.
- The dimension of the words used might shift based on the mental state of the user.
- A person can bypass the system by manipulating the options but still be in a state of depression , there is no method to verify the genuinity of the response.
- A person can be able to exhibit a regular mentality in response but still be in tears.

Our idea for depression detection incorporates three key parameters: responses to the PHQ-9 questionnaire,facial emotion recognition, and time analysis. We use the textual responses of individuals to the PHQ-9 questionnaire, which is widely used to diagnose depression. Additionally, we employ face recognition with Mediapipe to extract and analyze facial emotions that may indicate signs of depression. To further refine our analysis, we also consider the time taken by each individual to answer each question, which is normalized between 0 and 1.we use Naive Bayes model to obtain a score for the PHQ-9 responses, facial expression score and the time score then the weighted average score is then used to predict whether the individual is depressed or not, based on a threshold value.This approach provides a robust and accurate way to detect depression and has the potential to improve early detection and intervention in individuals at risk. The proposed methodology for depression detection involves three key parameters: responses to the PHQ-9 questionnaire, facial emotion analysis using Mediapipe, and time taken to fill the form. The methodology for implementation is as follows:

- Data collection by collecting a dataset of individual responses to the PHQ-9 questionnaire, along with their facial images.
- Face recognition, analyzing facial emotions, assigning scores and computing statistical measures and normalizing the statistical measures using z-score normalization.
- Time Analysis by recording the time taken by the individual to answer the entire test, and calculate a score based on the time taken.
- Combining the results by using the weighted average approach and Naive Bayes analysis to obtain an integrated score..
- Depression Prediction using weighted average score to predict whether the patient is depressed or not.
- Evaluation, Deployment and Monitoring of the model.

Overall, this approach provides a robust and accurate way to detect depression using Naive Bayes analysis and face recognition techniques. By incorporating the time taken to answer each question in the questionnaire, the model can also capture additional information that may be relevant for depression detection.

Our proposed project delivers:
- Improved accuracy and reliability in detecting depression using machine learning and face recognition compared to conventional systems.
- Early detection of depression, leading to timely interventions and improved treatment outcomes.
- Easy and Increased accessibility of depression detection to individuals who may not have access to conventional healthcare systems.
- Reduction in the social and economic costs associated with untreated depression.
- Improved resource allocation in mental health services and overall quality of life for depressed individuals.

Our proposed approach to detect depression through the integration of three parameters - responses from PHQ9, facial emotions, and time taken to fill the form - and leveraging the power of Naive Bayes algorithm offers a reliable and cost-effective solution to address the pressing issue of depression in mental healthcare. By providing a non-invasive and accessible means of identifying depression in individuals, our model can assist in early detection and intervention, ultimately mitigating the risk of severe outcomes. This project represents a significant stride towards the use of technology to improve the diagnosis and treatment of depression.

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References:
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